(as *Saturnia carpini* and *Orgyia antiqua*) accept the first male that arrives, while those of others (as *Charaeas graminis*) allow a period of competitive courtship ; and, further, that as a rule moths with bright colours belong—or at a former period did belong—to the latter group rather than to the former.

Plate's own view as to female choice is that it is exercised only as between pairing and not pairing. There is, he thinks, plenty of evidence as to success or failure of incitements employed by the male, but little or none of choice by the female between individual suitors. The distinction seems rather delicate. A would-be pairer may fail from want of sufficient power to charm the female ; but rejection implies choice, and if competitive incitement *does* take place, as Plate seems to allow, whether simultaneously or successively, how does this differ from sexual selection in Darwin's sense ?

On the subject of "sports," the author is no doubt right in contending that they have little or no bearing on the question of species-formation. But before unreservedly asserting that they must tend to be swamped by intercrossing with the parent species, he would have done well to examine the evidence brought forward by Standfuss and others in support of the position that the crossing of an aberration with the parent form may often result, not in the production of intermediate types, but in the sharp cleavage of the offspring into two groups, each resembling one of the parents and not the other. If these observations and experiments are to be relied on, they imply the theoretical possibility of a sport, supposing it to be selected, eventually displacing the parent form ; and, indeed, there is little doubt that under domestication something very much like this has actually occurred.

The treatment of adaptation is in many respects excellent. Kallima, the well-known Indian genus of leaf-like butterflies, is once more brought to the front and used as a conclusive instance of selection, furnishing also a good *reductio ad absurdum* of the "photographic" theory. But the author introduces a needless confusion by his method of handling the subject of "direct" and "indirect" adaptation. The former, he says, is repudiated by the "School of so-called Neo-Darwinians," of whom he specifies Weismann, Wallace and Spengel. It is certainly repudiated by them in the sense that they see no evidence for the "transmission of modifications due to individual plasticity," to use Lloyd Morgan's expression. But a distinction much more in accordance with the facts is that between "variable" and "invariable" adaptations. In the former are included such cases of individual assimilation in colour to surrounding conditions as have been principally made known, in the instance of caterpillars and chrysalises, by the labours of a "Neo-Darwinian." These adaptations are apparently "direct" in the sense that they mark a reaction of the individual to its own environment, but not in the sense that they are in any way actually produced by that environment. In common with all other cases of adaptation, whether variable or invariable, they are ultimately the result of a process of selection. The sensitive species is selected, not because it is green or because it is brown, but because in response to the appropriate conditions it is capable of becoming either one or the other. Plate's inclusion of Haeckel, Lloyd Morgan, Osborn and Henslow in the same category of believers in "direct adaptation," together with his criticism of Baldwin on an earlier page, serves to show that he has imperfectly grasped the point at issue. What we hold to be the true doctrine has been excellently expressed by Spengel in a passage quoted by Plate with disapproval (p. 141).

Though we have felt bound to express dissent on many points, we must not be taken as undervaluing Plate's labours. On the contrary, we have formed a high opinion of his knowledge, industry and argumentative power. As a champion of the indispensability of natural selection he has done excellent service, and it is only to be regretted that in adopting this illuminating principle he has failed to set himself free from the bonds of what seems to us a fanciful and unnecessary adjunct. F. A. D.

A TEXT-BOOK OF ELECTRICITY.

Deschanel's Natural Philosophy. III. *Electricity.* By J. D. Everett. Pp. xii + 358. (London : Blackie and Son, Ltd., 1901.)

PROF. EVERETT'S "Deschanel" is too well known to need commendation, and the new edition which is now before us has the many merits of its predecessors. The account it gives of fundamental electrical phenomena is admirable, the descriptions of apparatus are clear and good, though at times slightly too concise, the printing is well arranged and accurate, and the illustrations are excellent. In places, it is true, we recognise old friends which have done duty somewhat too often.

At the same time, the task just now of writing a really satisfactory text-book of electricity is a most difficult one, and Prof. Everett's success is not complete.

"The work," he says in his preface, "is in the main new. Electrical theory has been revolutionised during the past few years ; and great need exists for a text-book which shall present the subject in its present shape as a clear and connected whole without demanding on the part of the reader an exceptional amount of mathematical knowledge. This is the want which I have endeavoured to supply."

"The work is *in the main* new." Prof. Everett has hampered himself in his attempt to give a modern theory of electricity by retaining even that part of the old which he has kept ; the result is somewhat of a patchwork. Thus, Maxwell's conceptions with regard to electric action in dielectrics are introduced as "a new chapter in electrostatics." What was wanted was not an additional chapter in an old book, but an elementary account of the fundamental phenomena of electrostatics, given in the language of Maxwell's theory.

The book commences with electrostatics, and of necessity the language used at first is that of the theory of action at a distance. A charged body attracts light bodies and repels other bodies similarly charged ; the action of a gold leaf electroscope depends on the repulsion between the like charges of the leaves ; the electrophorus is described as a means of obtaining electricity in small quantities, but no explanation is given in §30 of its action.

The idea of electric potential is introduced in chapter vi., the first of the chapters in large type. These, it is

said, "will be found to contain a connected account of everything essential to a first course of modern electrical theory."

But in chapter vi. the definition of potential is a mathematical one. The distinction between scalar and vector quantities is drawn, and it is pointed out that in many cases the line integral of a vector between two points is independent of the path, and that in this case the vector is said to have a potential, the value of the line integral being the difference of the potentials at the two points which are taken as the extremities of the path.

A number of mathematical propositions connected with the theory of potential are then proved or illustrated in a very interesting way; but the application of the theory to the fundamental facts discussed in the earlier chapters is hardly attempted.

The beginner might be given some idea of the nature of potential without being asked to grasp the meaning of a line integral. Faraday's and Maxwell's notions as to the tension along the lines of force and the pressure perpendicular to them which occurs in a dielectric medium may be used, without the introduction of symbols, to explain the simple attractions and repulsions described in the earlier chapters; the link between the ancient observations and the modern theory is wanting, and the loss to the reader is very marked.

The same want is illustrated in the two following chapters. The quantity K, the specific inductive capacity of a medium, is defined in the usual way in §70, and a footnote tells us "it is identical with the permittivity or dielectric co-efficient K." This statement is repeated in the next chapter, on electric action in dielectrics, but the author does not explicitly establish the connection; a few words at the end of §86 would do it, the words, however, are wanting.

Or again, K is defined as the ratio of the polarisation, or the intensity of the electric displacement, to the force. Now the force has a perfectly definite meaning, and the inductance K can be defined in unambiguous terms; why then make it depend on "a peculiar distortion called electrical displacement" which is "roughly represented by supposing every tube of force to be divided into cells by elastic membranes firmly attached to the tube, these cells being completely filled with incompressible liquid. The distortion does not displace the sides of the tube, but it displaces the liquid a little way along the tube, in the direction of the force F, further displacement being prevented by the elastic resistance of the membranes."

The inductance of a dielectric is too important a physical quantity to be defined in terms of something which can only be explained by an incomplete analogy; it is surely better to say that the force between two given charges is found to depend on the medium in which they are placed, so that the complete law of force is $F=ee^1/Kr^2$, where K is a constant for a given medium, and is known as the permittivity or inductance of the medium. Then the statements in §80 as to the modification of fundamental formulæ follow naturally; as it is, they seem to the reader to depend on the analogy between the flow of a liquid and electric displacement, and not to rest on an experimental basis.

The earlier chapters on magnetism are clear and good, §148, giving the reason why a bar of soft iron sets parallel to the lines of force, may be specially commended. Chapter xiii. gives a useful development of magnetic theory; the proof of the relation, however, between B and H, §158, might be given in fuller detail, and a reference to §83 as well as to §90 would not be misplaced.

The rest of the book is taken up with the theory of electric currents and electro-magnetism, and can, on the whole, be warmly commended. The description of instruments, ammeters, voltmeters and the like is brought up to date. At times, possibly, almost too much is attempted for the space available, *e.g.*, in the very condensed account of the ballistic galvanometer in §200. Again, some preliminary account of a voltaic cell is needed before §213, which begins "In a circuit consisting of a battery of four similar cells."

In places the book would be improved by a more distinct reference to the fundamental experiments on which the various laws are based. Thus in chapter xix., after a reference to a statement as to the force exerted on a wire carrying a current in a magnetic field, we pass on to "two fundamental formulæ." These formulæ give the electrical and mechanical forces on a conductor carrying a current when in a magnetic field, and various important deductions are drawn from them in an admirable manner in the following paragraphs. But we miss any clear indication of the method by which these two fundamental formulæ are deduced from experimental results.

The chapter on dynamos is specially good; there is sufficient detail to enable the student to grasp the principles which underlie the action of the various forms, while at the same time the book is not overburdened with accounts of small differences of construction which, though they are of great importance to the student of dynamo design, have no place in a general text-book.

Enough, perhaps, has been said to show the value of the book. Prof. Everett has rendered a real service to his readers by his new edition; the book is one which is sure to become popular and to be valued alike by teacher and by student.

AN ESSAY IN CRITICAL BIBLIOGRAPHY.

The Periodic Classification and the Problem of Chemical Evolution. By G. Rudorf. Pp. xvi + 228. (London: Whittaker and Co., 1900.) Price 4*s.* 6*d.*

THE object of this work, as stated by the author in his preface, is one which should command hearty approval. The author aims at presenting a summary of the work done and the speculations advanced in the particular field indicated in the title. The publication of such summaries has long been customary in Germany, and it is to be hoped that the custom may become more common in England. Most text-books published in this country suffer from one or other of two defects. Either they are very elementary in scope and wholly didactic in treatment, or they are diffuse in treatment and of unmanageable size. This work certainly does not fall under either condemnation. It deals with a difficult subject, and is rather suggestive and argumentative than didactic. On the other hand, it is neither unreasonably long nor over-elaborate in treatment. Indeed, it sometimes errs in the other direction.